

New Record of *Karoowia saxeti* (Stizenb.) Hale in South Korea

Kwang-Mi Lim¹, Yoshikazu Yamamoto², Hiroshi Harada³, You Mi Lee⁴, Young Jin Koh¹ and Jae-Seoun Hur^{1*}

¹Korean Lichen Research Institute, Sunchon National University, Sunchon 540-742, Korea

²Department of Biological Production, Faculty of Bioresource Sciences, Akita Prefectural University, Akita 010-0195, Japan

³Natural History Museum and Institute, Chiba, Aoba-cho 955-2, Chuo-ku, Chiba 260-8682 Japan

⁴Div. of Specimen and Genetic Resources, Korea National Arboretum 487-821, Korea

(Received September 8, 2006)

Karoowia saxeti was recorded during the lichen field expedition in southern part of Korea in 2006. The lichen was found on the rock surface along coastal line. This species was easily recognized by chemistry (K+ yellow) and the presence of isidia. Thallus was saxicolous, subcrustose, more or less lobate at the center with clearly lobed margins, 2~6 cm broad and pale yellowish green. Thalli lobes were irregular, variable, up to 1.0mm wide, not branched, flat to more or less convex and contiguous to subimbricate. Upper surface of the thalli was continuous, emaculate, moderately isidiate. The isidia was subglobose to cylindrical, darkening at the tips and unbranched. Low surface of the thalli was black with a spongy rhizoidal and lamellar layer. HPLC analysis proved the presence of stictic acid (K+ yellow), norstictic acid and usnic acid. This is the first record of the species in South Korea.

KEYWORDS: Isidia, *Karoowia saxeti*, Korea, Lichen, Lichen-forming fungi, Stictic acid

The genus *Karoowia* is one of the unique lichenized Ascomycetes. The genus comprises ca. 20 species and belongs to the family Parmeliaceae (Index fungorum: <http://www.indexfungorum.org/Names>). This genus was separated from the genus *Xanthoparmelia* by Hale (1989). The specimens of *Karoowia* appear to be very similar to *Xanthoparmelia*, but they are almost subcrustose, small and very tightly adnate, often with a strongly areolate-cracked center and effigurate-lobate thallus margins. More significantly, they lack rhizines and either have a nearly bare lower surface or one covered with rhizoid-like attachment organs which have been misinterpreted as poorly developed rhizines (Hale, 1989). There has been no record on *Karowia* lichen in Korean Peninsula so far (Hur *et al.*, 2005). During the domestic survey of lichen flora in South Korea, *Karoowia saxeti* was newly found, which is reported in this paper.

Materials and Methods

The description of the external morphology was based on the air-dried material observed under a dissecting microscope. The specimen used in this study was deposited in the lichen Herbarium of Korean Lichen Research Institute (KoLRI) in Sunchon National University, Korea. Specimens from Natural History Museum and Institute, Chiba (CBM), Japan were also examined for comparison purposes. Chemical analysis was made by HPLC method (Yoshimura, 1994) using YMC-Pack ODS-A column and

eluent solvent of MeOH:H₂O:H₃PO₄ (= 80 : 20 : 1, v/v).

Genus *Karoowia* Hale in Mycotaxon 35: 177 *Gaekbawimaehwajieu* Genus

Thallus tightly adnate, margin lobate, center subcrustose-areolate, lobes sublinear, 0.2~1.2 mm wide. Upper surface continuous, emaculate, often pruinosed. Lower surface with rhizoid or forming lamellae. Conidia cylindrical. Apothecia immersed and aspiciloid or emergent. Spores ellipsoidal, simple.

Karoowia saxeti (Stizenb.) Hale in Mycotaxon 35: 190. *Gaekbawimaehwajieu* Fig. 1. A~C

External morphology: Thallus saxicolous, subcrustose, more or less lobate at the center with clearly lobed margins, 2~6 cm broad, pale yellowish green (Fig. 1A); lobes subirregular, variable 0.4~1.1 mm wide, sparingly branched, flat to more or less convex, contiguous to subimbricate (Fig. 1B); upper surface continuous, emaculate, shiny, moderately isidiate, the isidia subglobose to cylindrical, darkening at the tips, unbranched (Fig. 1C); lower surface black with a spongy rhizoidal and lamellar layer. Pycnidia common; conidia cylindrical, 0.5 × 6~8 μm. Apothecia initially aspiciloid but soon emergent and sessile, the disk brown, 0.5~0.8 mm in diameter; spores 5~6 × 9~11 μm.

Chemistry: Medulla K+ yellow; stictic acid, norstictic acid and Usnic acid (Fig. 2)

Habitat and ecology: Scattering on the rock surface of exposed splash zone along sea coastal lines with other lichens such as *Xanthoria* and *Caloplaca* sp. together (Fig. 1D).

*Corresponding author <E-mail: jshur1@sunchon.ac.kr>

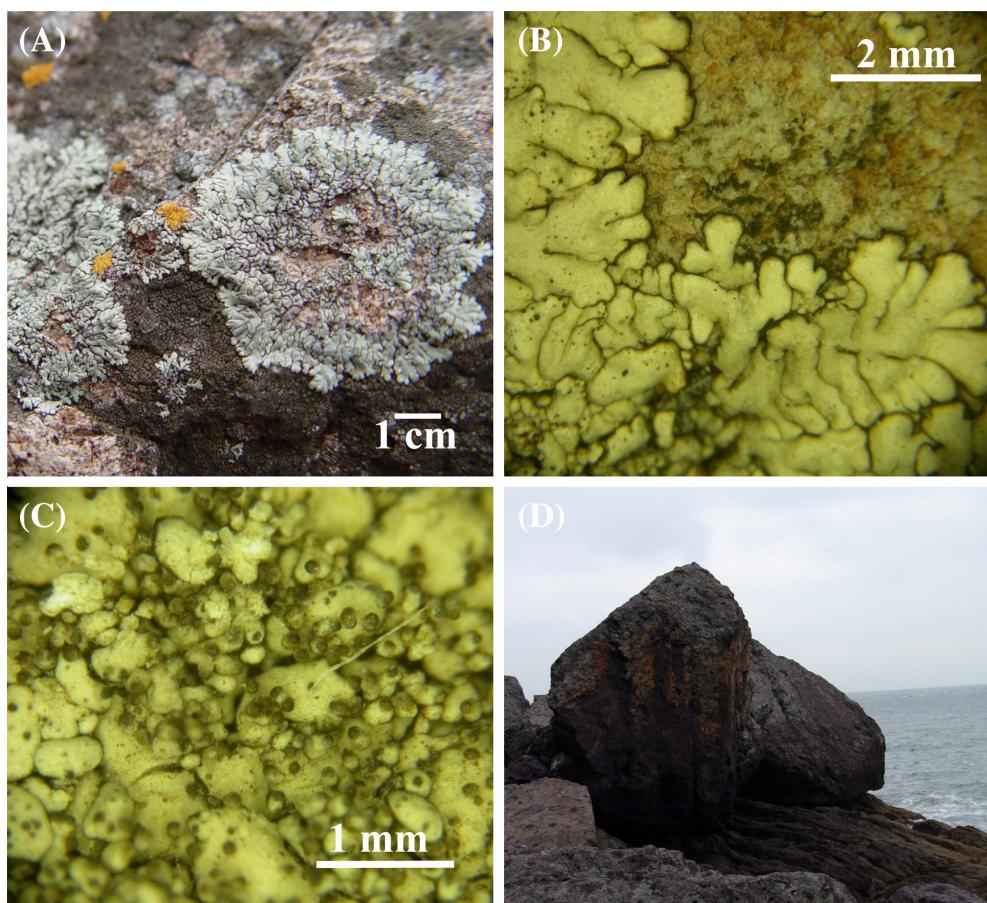


Fig. 1. *Karoowia saxeti*. A) Habitat, B) Upper surface and lobes, C) Isidia, D) Seaside rocks where the lichen (Hur 06-0001) grows with other lichens (*Caloplaca* and *Xanthoria* sp.).

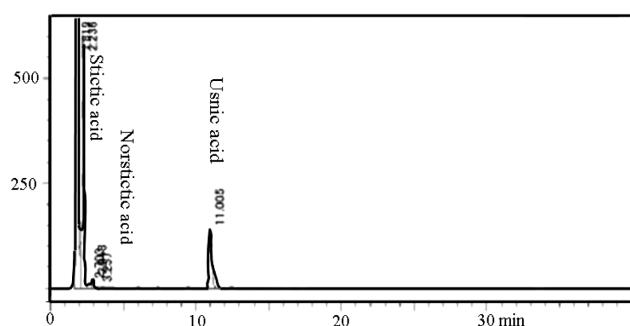


Fig. 2. HPLC of acetone extract of *Karoowia saxeti* (Hur 06-0001). Column YMC-Pack ODS-A, 150 × 4.6 mm I.D., S-5 μ m, 12 nm, solvent MeOH : H₂O : H₃PO₄ = 80 : 20 : 1 (v/v/v), column temp. 40°C, detection wave length 180~700 nm (254 nm).

Distribution: It is the most widespread species in the genus on the world level and occurs commonly on sandstones in South Africa, South West Africa, Brazil, Uruguay, Australia, Hong Kong, Taiwan, Japan and India. However, this is the first record of *Karoowia saxeti* in Korea. East Asian specimens (Taiwan, Japan and Korea) were mainly found along sea coast.

Specimen examined: South Korea, Jeonnam Prov., Yeosu., Dolsan island, 34°41'02.6"N, 127°46'50.8"E, 5m alt., on seaside rock (splash zone), Hur 06-0001; Japan, Wakayama-ken, Higashi-muro-gun, Koza-cho, Morotzaki point, 5m alt., on seaside rock (supertidal zone), Harada 16130. Ohshima island (Yashiro island) Yamaguchi-ken, Ohshima-gun, Touwa-cho, Yun, Hokibaba point, 6m alt., on basaltic rocks (splash zone), Harada 16295.

Remarks: This species is easily recognized by chemistry (stictic acid) and the presence of isidia. Only two species of *K. microscopica* and *K. saxeti* are isidate, but the former has no stictic acid (K-).

Acknowledgement

This work was supported by a grant from the Bio R&D Program (Grant M10508050002-05N0805-00212), Ministry of Science & Technology, and Korean Forest Service Program (KNA 2005-16) through Korea National Arboretum.

References

Hale, M. E. 1989. A monograph of the lichen genus *Karoowia*

Hale (Ascomycotina: Parmeniaceae). *Mycotaxon* **35**: 177-198.
Hur, J.-S., Koh, Y. J. and Harada H. 2005. A checklist of Korean
lichens. *Lichenology* **4**: 65-95.
Yoshimura, I., Kinoshita, Y., Yamamoto, Y., Huneck, S. and

Yamada, Y. 1994. Analysis of secondary metabolites from
lichen by high performance liquid chromatography with a pho-
todiode array detector. *Phytochemical Analysis* **5**: 197-205.